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ABSTRACT

A national analysis of survey information on educational expenditures marks the first time such a study has been done at the school-district level rather than the state level. Data on more than 4,000 school districts were derived from the National Center for Education Statistics 1987-88 Schools and Staffing Survey and the U.S. Census Bureau's report on school district expenditures. The findings indicate that substantial disparities exist in expenditures across school districts, and that the standard school-finance measures of dispersion indicate that the national variation exceeds the variation found in most, if not all, of the states. The analysis also shows that higher spending districts exhibit lower pupil-teacher ratios. Rural school districts have the lowest pupil-teacher ratio, followed by the suburbs of cities with a population of more than 500,000. In general, the larger the city, the lower the pupil-teacher ratio for both the city and its suburbs. More importantly, the findings show considerable differences in the propensity of school districts to spend additional funds on teacher resources. On average, a 10 percent average increase in district spending leads to a 5 percent increase in spending for smaller classes and higher teacher salaries. (JPT)

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The Allocation and Use of Educational Resources: District Level Evidence from the Schools and Staffing Survey

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Abstract

This paper describes our initial findings in an analysis of educational expenditures using a nationally representative sample of over 4, 000 school districts. These data were derived by merging the results of the National Center for Education Statistics 1987-88 Schools and Staffing Survey with the U.S. Census Bureau's report on school district expenditures. The results are important because it is the first time a national analysis has been possible at the district rather than the state level.

Our findings indicate that there are substantial disparities in expenditures across school districts, and that the standard school finance measures of dispersion would indicate that the national variation exceeds the variation found in most, if not all, of the individual states.

The analysis also shows that pupil/teacher ratios vary considerably across school districts, with higher spending districts exhibiting lower pupil/teacher ratios. Moreover, rural school districts have the lowest pupil/teacher ratio, followed by the suburbs of very large cities (over 500,000 population). In general, suburbs have lower pupil/teacher ratios than the cities they surround, and the large the city, the lower the pupil/teacher ratio in both the suburbs and the cities they surround.

Perhaps more importantly, the findings show considerable differences in the propensity of school districts to spend additional funds on teacher resources. Our findings indicate that, at the mean, a ten percent increase in district spending will lead to approximately 5 percent higher spending for lower class sizes and higher teacher salaries. Specifically, approximately 4 percent would be used to lower class size, and one percent to raise teacher salaries. As shown in the paper, this compares to an estimate of more than 8 percent growth in these two factors combined when state level data is analyzed.

THE ALLOCATION AND USE OF EDUCATIONAL RESOURCES: DISTRICT LEVEL EVIDENCE FROM THE SCHOOLS AND STAFFING SURVEY

by

Lawrence O. Picus[1]

INTRODUCTION

The citizens of the United States spend over $200 billion a year on pubic elementary and secondary education. These funds are used to provide a range of educational services to nearly 42 million children, employing 2.4 million teachers and almost 400,000 additional instructional staff (NEA). Despite this tremendous commitment to the education of our children, we know surprisingly little about how these funds are actually used, or how new or additional funds are likely to be spent by the nearly 16,000 school districts across the nation. While school districts are required to maintain detailed revenue and expenditure budgets for their operations, state level fiscal reporting requirements vary dramatically. Moreover, the use of different reporting systems makes comparisons across states complex and difficult. While there are a number of national data collection efforts undertaken on a regular basis, Barro (1992a) points out that incompatibilities across the major collection efforts results in a situation where "there is not a fully satisfactory way to answer even so seemingly straightforward a question as 'how much of total expenditure for elementary and secondary education in the United States goes to pay teachers' salaries?'"

The Finance Center of the Consortium for Policy Research in Education (CPRE) has developed a strategy for improving the current state of knowledge on resource allocation in elementary and secondary schools. Called the Integrated, Multi-level Resource Allocation study, the Center is conducting a multi-year, multi-faceted study of "what dollars buy" in education. Specifically, Center researchers are conducting analyses of spending and resource allocation patterns at the national, state, district and school levels.

The Center's initial work on this project focused on state level comparisons at the national level (see Barro, 1992a). This work, relying on data from the NEA, NCES and the Census Bureau, offered some initial findings on how educational dollars are used by public elementary and secondary educational institutions by comparing state level aggregate data. The work reported here represents a second and more in-depth look at resource allocation patterns, this time at the district level using merged data from the NCES 1987-88 Schools and Staffing Survey (SASS) and the Census Bureau's Census of Governments, 1987. Future analyses will consider school level variables and attempt to

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[1]I would like to thank Minaz Bhimani and Sami Khedhiri for their data processing assistance on this project. I would also like to thank Allan Odden, Yasser Nakib, and Linda Hertert for reviews of earlier drafts of this paper.

develop multi-level models of resource allocation patterns. The specific questions to be answered in this study are:

1. How do current expenditures per pupil for elementary and secondary education vary across school districts and states after adjusting for interstate differences in costs?

2. How do staffing ratios, including teacher pupil ratios and other staff-pupil ratios vary among school districts? How do these variations in spending per pupil relate to district and student characteristics including community type?

3. How do teacher demographic characteristics and teacher experience and training vary among districts, and how do these differences relate to student demographic characteristics and to per pupil spending levels?

4. How does average teacher salary vary across school districts and how do those differences relate to district and student characteristics including community type and spending level.

5. What are the propensities of public school systems to spend marginal dollars to increase the teacher-pupil ratio (reduce class size), hire more experienced or better trained teachers, pay higher salaries for teachers, and purchase resources other than teachers?

This paper is divided into eight sections. Following this introduction, the second section describes the SASS and Census Bureau data bases that were used in the analysis, discussing both the strengths and limitations of the data presented herein to describe district level resource allocation patterns. The third section describes the variations in per pupil expenditures found in the analysis of the SASS and Census Bureau data. It provides detailed descriptive statistics on how per pupil expenditures vary with a number of district characteristics. The fourth section presents similar descriptive statistics on the variation in pupil/teacher ratios across districts and presents the results of our efforts to model the factors that affect class size. In the fifth section of this paper, an analysis of teacher demographic and experience characteristics is presented. The sixth section analyzes teacher salary at the district level. In addition to describing variations in average teacher salary and variations in the salary schedules of different types of districts, the results of a model to predict teacher salaries are presented in this section as well. The seventh section analyzes the propensities of public school systems to spend additional resources, estimating the shares of marginal dollars that are allocated to reducing class size, raising teacher salaries and spent on resources other than teachers. The eighth and last section of this paper offers some conclusions and recommendations based on this research and offers some suggestions for future research.

DESCRIPTION OF THE DATA BASE

The analysis reported here relies principally on two large-scale federal data bases, the NCES Schools and Staffing Survey (SASS) for 1987-88, and the U.S. Census Bureau's 1987 Census of Governments, 1987. The Census files contain expenditure data for the 1986-87 fiscal year, one year before the data collected through the SASS. Similar expenditure data for the universe of school districts is not available for 1987-88.

Although our merged data base has a one year lag between the expenditure variables and the staffing variables, we believe this analysis provides valuable information to educational policymakers because school district spending habits and

resource allocation patterns generally show relatively small incremental changes from year to year. Consequently, the relationships we found between spending and staffing patterns are unlikely to vary dramatically from what would be expected if fiscal and staffing data were available for the same fiscal year.

By merging the expenditure data from the Census Bureau with the staffing and enrollment information from SASS, it is possible for the first time to analyze educational resource patterns at the school district and even the school level. (For school level analyses see Picus, 1993a). Detailed information on each of the data bases is provided below.

The Schools and Staffing Survey

The 1987-88 Schools and Staffing Survey (SASS) is a comprehensive, nationally representative, survey conducted by the National Center for Education Statistics of 5,592 public school districts, 9,317 public schools in those districts, and over 56,242 teachers at these same schools. Similar surveys of private schools were conducted. Since resource allocation patterns in the public school system is the focus of this paper, this discussion is limited to the public school component of the SASS.

The SASS sample was not designed to be representative of individual states. As a result estimates of individual state level resource allocation patterns in school districts can not be undertaken with these data.[2]

The public school component of SASS consisted of four separate questionnaires. They include:

1. Teacher Demand and Shortage Questionnaire for public School Districts, distributed to school district administrators.

2. Public School Questionnaire, distributed to school principals

3. School Administrator Questionnaire, distributed to school principals

4. Public School Teachers Questionnaire, distributed to public school teachers.

The analysis described below relies primarily on data from the first two of these. Additional studies of school level resource allocation patterns are discussed in Picus, 1993a.

Census

Data on school district expenditures were collected from the Census of Governments, 1987: finances of Public School systems - File D. This electronic tape, available from the United States Bureau of the Census provides data for the universe of 16, 921 public elementary-secondary school districts and local institutions of higher education. Available data include district expenditures and revenues including

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[2]Specific state level analyses of school district resource allocation patterns at the district and school level are currently being developed. The current status of these efforts can be found in Picus and Nakib, 1993; Picus, 1993b, and Hertert, Chang and Picus, forthcoming.

breakdowns on the source of revenue and current expenditures for instruction, support services, food services and all others. Data on capital expenditures are also available. Data on current expenditures were the primary focus of the research reported here.

Merged Data Set

The first step in creating an analysis data set was to merge the data from the four SASS questionnaires. This was accomplished by comparing the control numbers on each form of the SASS data tapes provided by NCES. The second, and more complicated process was to merge this data set with the Census data. With the help of NCES staff, we were able to combine our merged SASS file with the Census of Governments - File D. Our final sample contained a total of 4,370 districts.[3] The fall-off in number of districts results from two factors -- non-response rates on the SASS questionnaires and inability to find matches for all of the SASS districts in the Census data. According to NCES, the response rate for the questionnaires was 89.4 percent for the District level survey of teacher supply and demand; 91.9 percent for the public school questionnaire and 94.2 percent for the administrator questionnaire, both of which went to school principals; and 86.5 percent for the teacher survey. For a district to be included in our sample, responses from all four levels had to be available.

When the combined SASS file was merged with the data from Census, a few additional districts were lost when matches could not be found. As a result, our final sample contains 4,370 school districts representing over 25 million students in grades K-12, for which SASS data were available, and 4, 334 districts with both SASS and expenditure data.

The next seven sections of this paper describe the results of our analyses using this merged database.

EXPENDITURES PER PUPIL: A DISTRICT LEVEL ANALYSIS

Data on school district expenditures were compiled from the Census of Governments, 1987: File D (U.S. Census Bureau, 1987). While the data collected by the Census Bureau for 1986-87 does not contain the same level of detail as is generally available from individual states, this file provides the only opportunity to compare school district expenditures with the staffing and salary decisions that are made by local school districts on a national scale.

The data available from the Census Bureau include total Elementary-Secondary expenditures for current operations, as well as subtotals for instruction, support services, food services and all other expenditures. These data are reported as district-wide totals, rounded to the nearest thousand dollars. Per-pupil expenditure figures were derived by dividing this total by the district's total K-12 enrollment as reported on the SASS district level teacher demand and shortage questionnaire.

Expenditure data were available from a total of 4,334 districts. Analysis of school district expenditures revealed one district reporting expenditures of over $100,000 per-pupil while 11 others with per pupil expenditures of less than $750. These extreme outliers were eliminated from the analysis because the expenditure figures appeared to be

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[3]Although the final sample contains 4,370 districts, individual analyses occasionally have fewer observations due to missing values.

errors or to represent very unusual circumstances. Elimination of these observations had only a minor impact on the overall sample statistics.

Table 1 shows the distribution of total per pupil expenditures and per pupil expenditures for instruction for the remaining 4,322 districts in the sample. The table shows that in 1986-87, average per pupil expenditures amounted to $3,659, and of that amount average expenditures for instruction were $2,137 per pupil. Table 1 indicates there are substantial disparities in spending across the districts in the sample. While the range of over $56,000 is dramatically overstated due to the presence of a few outliers, the range between the observations at the 99th and 1st percentiles is $7,921, a number which seems much more plausible. Finally, the range between the observation at the 95th percentile and the 5th percentile is $3,855.

The standard deviation for total per pupil expenditures is $1,912 and $961 for per pupil instructional expenditures. This indicates that while there is substantial variation in spending, the variation in instructional expenditures is 7.4 percent less than the variation in total expenditures. The coefficient of variation for total expenditures is 0.524 compared to 0.450 for instructional expenditures, confirming this pattern of smaller disparities in expenditures for instruction, and of substantial expenditure disparities across districts in the United States.

This effect is further substantiated when the percentage of per pupil expenditures devoted to instruction is considered. Districts in the sample spent an average of 59.16 percent of their funds on instruction. Although the extreme values for this variable, a low of 18.1 percent and a high of 95.7 percent, represent a substantial disparity, the overall variation is relatively small. The standard deviation is only 6.28 percent, and the coefficient of variation a relatively low 0.106. Moreover, the inter quartile range is 7.26 percent, indicating that the proportion of total expenditures devoted to instruction for half the districts in the sample is within 3.5 percent of the median which is 58.97 percent. Further analysis shows that the share going to instruction varies by just over 15 percent, for 80 percent of the districts, and larger disparities are only found at the extremes. Finally, as one would expect, there is a tendency for districts with higher per pupil expenditures to devote a smaller portion of their funds to instruction as evidenced by the correlation coefficient of -0.23 between per pupil expenditures and the percentage of expenditures going to instruction.

The problem with the data presented in Table 1 is they may be misleading because educational cost differentials across the states are not considered. Although no fully satisfactory index for variations in the cost of education among states has been developed to date, Barro (1992b) has developed a preliminary state level index for the 1978-88 school year using average teacher salary data adjusted for differences in experience and education, private sector wages and a constant term to represent the costs of non-personnel resources. This index was used to deflate the Census Bureau's expenditure figures for each district in the sample and the descriptive statistics for total and instructional expenditures per pupil recalculated.[4] The cost adjusted figures are presented in Table 2.

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[4]Although Barro's cost index was based on 1987-88 data, it has been used to adjust per-pupil expenditure figures for 1986-86 under the assumption that there is limited distortion from the one year difference because changes in relative costs in school districts can be expected to change very little in one year.

The data in Table 2 show a relatively modest change in average expenditures per pupil from an unadjusted $3,659 to an adjusted $3,698. Average adjusted instructional expenditures per pupil amounted to $2,164, substantially the same as the unadjusted figure of $2,137. The last column in Table 2 is identical to the last column in Table 1 because both expenditures and expenditures for instruction were deflated by the same index in each state. As a result, the proportion spent on instruction for any given district did not change. Additionally, the correlation between adjusted expenditures per pupil and the percentage devoted to instruction remained quite stable at -0.22 a change of 0.01 from the relationship with the unadjusted figures.

The variation in expenditures described above is mitigated to some degree when expenditures are adjusted for cost differences. For total expenditures, the standard deviation decreased 8 percent to $1,759, and for instructional expenditures it decreased by 14 percent to $825. The coefficient of variation declined from 0.522 to 0.476 for total expenditures and from 0.450 to 0.381 for instructional expenditures. This means that inter district inequality in cost adjusted spending is about 92 percent as great as inequality in unadjusted spending, and 86 percent as great when instructional expenditures are considered. This compares with Barro's (1992) finding across states that cost adjusted disparities were 72 percent as great as unadjusted disparities. This indicates that analyses of spending equity using state level averages appear to understate the variations in per pupil spending at the district level. This finding may have important implications for future federal policies regarding school funding.

Table 4 shows the variation in per pupil expenditures by geographic region and community type. The table shows that in both actual and price adjusted dollars, districts in the Northeast are the highest spending, and districts in the South the lowest spending. The average per pupil expenditures in the Northeast is more than $1,600 higher than the average in the South. Even when price differences are accounted for this difference is still in excess of $1,000. The second highest expenditures per pupil are found in the West, although when the figures are adjusted for price differences, the difference between districts in the West and the North Central regions is reduced to less than $100.

Across the four regions, the average proportion of expenditures used for instruction ranges from a low of 57.60 percent in the North Central region to a high of 61.48 percent in the South. Actual and price adjusted per pupil expenditures for instruction show the same regional pattern as found for total expenditures. They are highest in the Northeast, lowest in the South. The West shows higher average per pupil expenditures for instruction than does the North Central region in both actual and cost adjusted dollars.

An analysis of per pupil expenditures by community type reveals a number of interesting findings. With the exception of Indian Reservations, total per pupil expenditures, both actual and price adjusted, were the highest in suburbs of very large cities and in the suburbs of large cities. Next highest were very large cities and large cities, followed by medium cities. Interestingly, the suburbs of medium cities tended to spend less than the medium cities, opposite the pattern observed in large and very large cities. Spending in small cities and towns and in rural areas tended to be the lowest, with small cities spending an average of $1,200 less than the suburbs of very large cities. Table 4 also shows a similar pattern for per pupil expenditures on instruction. Moreover, the percent of total expenditures devoted to instruction remained fairly constant ranging form just 57.60% in the suburbs of very large cities to just over 60% in small cities and towns.

This analysis by region and community seems to indicate that as expenditures per pupil increase, the portion devoted to instruction declines. This is confirmed by the data presented above showing a correlation of -0.23 for the relationship actual expenditures and the percent devoted to instruction, and a correlation of -0.22 for price adjusted expenditures per pupil and the percent spent on instruction.

An important question that derives from this analysis of spending differences is how these disparities impact the way money is spent by school districts. The next section analyzes variations in pupil teacher ratios, and compares those differences to the level of spending in school districts.

VARIATION IN PUPIL TEACHER RATIOS AT THE DISTRICT LEVEL

The largest single item of expenditure in school districts is for the compensation of teachers. Barro (1992b) states that teacher compensation (salaries and benefits) accounts for 53 percent of all current spending by school districts. Thus, studying the number of teachers employed, and the salaries they are paid provides a great deal of information on how school systems choose to allocate the resources available to them. This section describes how teacher staffing patterns, specifically pupil-teacher ratios vary across school districts in the SASS/Census sample.

The SASS data collection allows analysis of variations in pupil/teacher ratios from a number of perspectives. The discussion that follows provides a picture of how staffing patterns are related to a variety of variables including district size, geographic region, community type, percentage of pupils receiving free or reduced price lunches (a proxy for poverty level), the minority enrollment of the district, and expenditure levels.

Pupil/teacher ratios were calculated for districts as a whole, and for elementary and secondary groupings. Using the district level Teacher Demand and Shortage questionnaire from SASS, the number of pupils in grades K-12 was divided by the reported number of teachers in each district. In addition, for all school districts that reported having students in any of grades K-6, a similar pupil/teacher ratio was calculated, as was the ratio for all districts reporting any enrollment in grades 7-12. Table 4 summarizes the overall pupil/teacher ratios for the SASS sample of 4,370 school districts. The mean pupil teacher ratio for the sample is 16.59, ranging from a low of 2 to a high of 40.4. The standard deviation is 3.92 and the coefficient of variation 0.236. Table 4 also displays similar data for the pupil teacher ratio in grades K-6 and grades 7-12. The table shows that average class size in the lower grades is more than three pupils per teacher larger. The table also shows more variation in the pupil teacher ratio for the two sub-groups that for the sample as a whole. The standard deviation for K-6 is 7.92 and for 7-12 it is 6.23. Moreover, the coefficient of variation for both sub-groups increases to over 040. The discussion that follows provides additional information on district characteristics that could impact the pupil/teacher ratio.

Table 5 shows the number and percent of districts by range of pupil teacher ratio for the entire sample and for the elementary and secondary sub-groups. The table shows that over 60 percent of the districts have a pupil/teacher ratio between 13 and 19. Just under 4 percent of the districts have fewer than 10 pupils per teacher, and just over 3 percent ratios of 25 or higher. When K-6 and 7-12 pupil teacher ratios are looked at separately, the pattern of larger classes in the elementary schools continues. While only 2.13 percent of the districts with elementary (K-6) classes have fewer than 10 pupils per teacher, over 10 percent of the districts with secondary schools have pupil/teacher ratios in this range. Similarly, over 8 percent of the districts with elementary schools have K-6 pupil/teacher ratios exceeding 25, while the similar figure for secondary grades is only

3.78 percent. In the center of the distribution, approximately the same share of the districts have pupil/teacher ratios between 13 and 19 -- 51 percent of the elementary districts and 49 percent of the secondary districts. A full 21.38 percent of the secondary schools and only 7.5 percent of the elementary schools in the sample districts have pupil/teacher ratios between 10 and 13. On the other hand, over 20 percent of the elementary districts have pupil teacher ratios between 19 and 22 while only 10.15 percent of the secondary schools have similar ratios.

Table 6 provides a breakdown of the number of pupils by the same pupil/teacher ratio categories used in Table 5. Of the more than 25 million students in the sample districts, over 10 million of them are in districts where the pupil/teacher ratio is between 16 and 19. This represents more than 41 percent of the sample. Looking at the breakdown between elementary and secondary class size, Table 6 shows over 14 percent of the elementary students in districts with a pupil/teacher ratio exceeding 25, and only 5.22 percent of the secondary students in that category. Similarly, less than 1 percent of the elementary students are in districts with pupil/teacher ratios of less than 10, while 2.47 percent of the secondary students are in districts with such small classes.

Variation by District Size

Table 6 shows how pupil/teacher ratios vary by school district size. Regardless of the level considered, a very clear pattern emerges from these data. As district size increases, so does the pupil/teacher ratio. The table also shows that regardless of level, secondary pupil/teacher ratios are lower than elementary ratios. The direction of the pattern could be predicted from the correlation coefficient of 0.14 between enrollment and pupil/teacher ratio for grades K-12 and similar correlation coefficients of 0.05 for elementary grades and 0.10 for secondary grades. However the strength of the pattern shown in Table 7 is somewhat surprising given the relatively weak values of those correlation coefficients, all of which are significant at the .01 level.

Variation by Geographic Region

There are also substantial differences in pupil/teacher ratios across geographic regions as shown in Table 8. This table shows that across all grade levels, the pupil teacher ratio is lowest in the Northeast and highest in the West. Moreover, the pupil/teacher ratio in the elementary grades is higher than the ratio for secondary grades in all four regions. The figures for the West are no doubt substantially impacted by Utah and California the two states with the largest class size based on national comparisons (see Barro, 1992a).

Variation by Community Type

Table 9 displays the average pupil teacher ratio by the type of community in which each district is located. These data were collected from the SASS Public School Questionnaire which asks each principal to indicate the type of community in which their school is located. In cases where different answers were given for schools in the same district, districts were assigned to community categories on the basis of enrollment. The category identified by principals in district schools with the greatest number of students was selected to represent the entire district.

The table also provides data on the distribution of the districts in the sample by community type. Except for Indian Reservations, which only account for 18 of the sample districts, the smallest classes are consistently found in rural areas. These districts constitute over 40 percent of the sample. Looking at the K-12 data, it is interesting to

note that suburbs consistently have lower pupil/teacher ratios than their associated cities. For example, the average pupil/teacher ratio in a suburb of medium sized cities was 16.39, slightly lower than the average pupil/teacher ratio of 17.06 found in medium size cities. Among the suburbs, those of very large cities had the lowest pupil/teacher ratio, while large and medium suburbs had virtually identical, and smaller pupil/teacher ratios of 16.37 and 16.39 respectively. Large city districts had the highest pupil/teacher ratio in the sample. This was followed by very large cities and then medium cities. Small cities had a lower pupil/teacher ratio than all other city and suburban districts.

Similar relationships between suburbs and cities exist among elementary grades. Suburban districts have consistently lower pupil/teacher ratios than their associated size cities. The highest pupil/teacher ratios are again in the very large cities. Small cities had lower pupil/teacher ratios than all but the very large suburban districts.

As described above, secondary pupil/teacher ratios were lower across all categories than were elementary pupil/teacher ratios. The pattern identified above among city and suburban district ratios remained the same, suburban districts having lower pupil/teacher ratios than city districts of the same size classification. As before, the very large suburban districts had the lowest pupil/teacher ratio, followed by large suburban and then medium suburban districts. The very large cities continue to have the highest pupil/teacher ratios.

Variation by Percent of Pupils Qualifying for Free or Reduced Price Lunches

Table 10 looks at the issue of class size in relation to income levels. Although income data are not directly available through the SASS, the percentage of students who qualify for a free or reduced price lunch was used as a proxy for income. Table 10 shows that there is very little variation in the pupil/teacher ratio as the percentage of pupils eligible for this program increases. With the exception of districts with fewer than 5 percent of their pupils qualifying for free or reduced price lunches, the variation in the pupil/teacher ratio was relatively small, ranging from 15.08 to 16.08, a difference of one student per teacher. The average pupil/teacher ratio for districts with fewer than 5 percent of the students qualifying for free or reduced price lunches was 14.35, less than one student per class lower than the lowest of the other categories displayed in Table 10.

The pupil teacher ratio in secondary grades was considerably lower than the ratio at elementary grades for all ranges displayed in Table 10. As with the entire sample, there was no distinct pattern or relationship between the percent of pupils qualifying for free or reduced price lunches and pupil/teacher ratios, and little variation in the ratios across categories. This is confirmed by the correlation coefficients between the percent qualifying for free or reduced price lunches and the pupil/teacher ratios which are 0.02 for all grades, 0.04 for elementary grades and 0.05 for secondary grades, essentially a random pattern.

Variation by Percentage of Minority Enrollment

In addition to the limited relationship between pupil/teacher ratios and measures of poverty described above, there is very little correlation between pupil/teacher ratios and the percentage of minority students enrolled in a school district. The correlation coefficients between the percent of minority pupils and pupil/teacher ratios were -0.001 for all grades, 0.03 for grades K-6 and 0.003 for grades 7-12. None of the correlation coefficients are statistically different from zero at the 0.05 level. The random pattern is confirmed in Table 11 which displays the average pupil/teacher ratio by the percent of minority students in the districts. The lowest pupil/teacher ratios are at the extremes of

minority enrollments. The lowest pupil/teacher ratio for all grades and for grades K-6 is in districts with more than 70 percent minority students, while those districts have the second lowest average pupil/teacher ratio at the secondary grades. The next lowest pupil/teacher ratio is consistently found in the districts with the lowest minority enrollments. The only exception to this pattern is at the secondary grades, where districts with 40 to 50 percent minority enrollments have an average pupil/teacher ratio of 10.18. Outside of this category, the pattern described above for the other grade categories holds. One important factor to consider in looking at Table 11 is over 57 percent of the districts have a minority enrollment of under 5 percent.

The lack of any pattern between pupil/teacher ratios and either the poverty index or the percent minority pupils is somewhat surprising. One might have anticipated that the highest concentrations of minority pupils would be found in the large inner-city districts, and thus pupil/teacher ratios would increase as the percent of minority students in a district increases. That this is not the case is confirmed by the correlation between district size (enrollment) and percent of minority students which is a relatively weak 0.18. The relationship between enrollment and the poverty index is 0.006 which indicates no relationship at all.

Variation Based on Per Pupil Expenditures

Tables 12, 13 and 14 summarize pupil/teacher ratios by expenditure level. Table 12 presents average pupil/teacher ratios by total expenditures per pupil, while Table 13 shows the same data for instructional expenditures per pupil. Table 14 presents average pupil/teacher ratios on the basis of instructional expenditures as a percent of total expenditures per pupil. Both Tables 12 and 13 show a very consistent pattern with pupil/teacher ratios decreasing as total expenditures and expenditures for instruction increase. This is what would be expected intuitively given spending on teacher salaries represent the single largest expenditure item for school districts. The correlation coefficient between the teacher/pupil ratio for grades K-12 and per pupil expenditures is 0.456 and for instructional expenditures it is 0.465. A similarly strong relationship for the elementary grades exists with a correlation of 0.401 for total expenditures and 0.409 for instructional expenditures. This pattern is not quite as obvious for the secondary grades. The relationship between spending and pupil/teacher ratio in those grades is weaker, with a much lower correlation coefficient of 0.175 for total expenditures and 0.189 for instructional expenditures. All of the correlation coefficients reported above are significant at the 0.0001 level.

Surprisingly, the relationship between pupil/teacher ratios and expenditures begins to disappear when the proportion of total expenditures devoted to instruction is considered. As the percent of total expenditures going to instruction increases, the pupil/teacher ratio does not decline as consistently as it does in comparison to actual expenditures. This is somewhat surprising since the largest component of instructional expenditures is undoubtedly teacher salaries. Yet the correlation between the percent of total spending going to instruction and the K-12 pupil/teacher ratio is only 0.016, and not statistically different from zero. Even lower correlation coefficients of 0.003 for elementary grades and 0.012 for secondary grades were found, neither of which is statistically significant at the 0.05 level.

Determinants of Pupil/Teacher Ratios at the District Level

To ascertain the impact of the individual factors reported above on class size, and the data on average teacher salary which is detailed below, a series of multiple regressions were estimated. Using the teacher/pupil ratio as the dependent variable and

the factors cited above as independent variables the impact of each, holding the others constant can be estimated.[5]

The analysis presented above shows considerable differences when staffing ratios are analyzed separately for elementary and secondary grades. Consequently, three separate regression equations were estimated. The first used the teacher pupil ratio for grades K-12 as the dependent variable, while the second and third used the ratios for elementary (K-6) and secondary (7-12) grades respectively. The independent variables included per pupil expenditures, school district enrollment, the percentage of students qualifying for free or reduced price lunches, the percentage of students in each district who are ethnic minorities, the district average salary, and a series of dummy variables to reflect community type. Since rural districts represent the largest community group, with nearly 44 percent of the districts (See Table 9), the rural community type was used as the basis for comparisons with the other dummy variables. The results of all three equations are displayed in Table 15.

The last row of Table 15 displays the R^2 for each of the three equations. That row shows that the equation for K-12 teacher/pupil ratio explained over 29 percent of the variation in the ratio, while the elementary and secondary grade equations explained a much smaller share of the variance in the respective ratios for those grade levels. The secondary equation only explains about 6 percent of the variation in the teacher pupil ratio found in grades 7-12, whereas the elementary equation accounts for nearly 19 percent of the variation in grades K-6. This finding is not surprising considering the patterns that emerged above are not as obvious for the secondary grades as they are for the elementary grades and for all grades.

The impact of expenditures per pupil (PPEXP) shows the expected positive sign for all three equations, and although the coefficients appear very small, they are quite significant. For example, the coefficient of 0.0000033 in the K-12 equation implies that a $1,000 increase in per pupil expenditures is associated with an increase in the teacher/pupil ratio of 0.0033. At the mean, this corresponds to a change in the teacher pupil/ratio from 0.0603 to .0636, or a decrease in the pupil/teacher ratio of 0.84 students. This means that spending differentials of $4,000 per pupil would translate into classes that are on average 3.44 students smaller, and a difference of $6,000 per pupil would translate into a class size differential of 5.16 students per teacher. The corresponding class size decrease for a $1,000 increase in per pupil spending at the elementary level is 0.91 pupils and in secondary schools 0.23 pupils. This means at the elementary school level each additional $1,000 in per pupil spending results in a class size reduction of almost one student, while at the high school level, it would take just over $4,000 to achieve the same result. This is no doubt in part because the secondary school class sizes are already considerably smaller than the elementary grade classes.

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[5]It should be noted that for the purposes of this analysis, class size is estimated as a teacher/pupil ratio rather than the pupil teacher ratio reported above. Although this may cause readers some confusion, the teacher/pupil ratio makes the analysis of multi -variate models more straightforward since the signs on the coefficients are easier to interpret. For example, higher spending, as shown above would be expected to correlate with lower class size, and thus negative coefficients. Since the teacher/pupil ratio is the reciprocal of the pupil/teacher ratio, as expenditures increase, the teacher/pupil ratio would also be expected to increase (more teachers for a given number of students and thus smaller classes), resulting in positive signs for the coefficient. We elected to use the more traditional pupil/teacher ratio above as it is easier for most readers to interpret.

Not surprisingly, increases in enrollments are associated with increases in class size. The coefficient for enrollment (LEAENR1) in the K-12 equation of -0.000000064, implies that an increase of 1,000 students in a school district (a substantial influx of new students for most school districts across the nation) would be accompanied, at the mean, with a reduction in the teacher pupil ratio of -0.000064, from 0.0603 to 0.0602 which translates to an increase in the pupil/teacher ratio from 16.59 to 16.61. Similarly small effects can be found in the equations for the elementary and secondary grades.

These findings seem to imply that while districts manage to reduce class size to some degree when additional funds are available, they attempt to maintain class size as new students enroll, indicating that additional staff are hired to maintain existing class size.

The negative signs associated with the coefficients for average teacher salary (SALAVG) indicate that higher salaries are associated with larger classes. The Coefficient of -0.000000555 for SALAVG in the K-12 equation implies that if the average teacher salary increases by $1,000, the teacher pupil ratio will, at the mean, decline by -0.000555. This corresponds to an increase in the pupil/teacher ratio of 0.13 students. Thus, even salary differentials of as much as $8,000 lead to class size increases of only one student, indicating that districts make greater efforts to maintain class size than pay teachers more.

With the exception of a small increase in class size as the proportion of students who qualify for free and reduced price lunches goes up in the K-12 equation, the poverty index and district minority enrollment have no statistical impact on class size. In the K-12 equation, if the share of student qualifying for free and reduced price lunches increases by 10 percent, the corresponding increase in the pupil/teacher ratio is a negligible 0.06 students. Across the spectrum this translates into a class size increase of 0.3 students for districts with half of their students qualifying for free or reduced price lunches compared to districts with no students meeting the income level qualifications for this program.

Interestingly, the effect of community type on the teacher/pupil ratio was most obvious in the K-12 equations, where all of the coefficients were statistically different from zero at least at the 0.05 level. This confirms the finding in Table 9 that the pupil/teacher ratio is lowest in rural areas. In fact, with the exception of military bases and Indian reservations, the magnitudes of the coefficients have the same ranking as the magnitude in the difference between rural pupil/teacher ratios and the pupil/teacher ratios in other types of communities. This finding did not hold up for Indian reservations and military bases due to the small number of districts in each of those groups.

Summary

The discussion of variation in pupil/teacher ratios presented above shows that the pupil/teacher ratio is related to a number of school district characteristics. The strongest relationship found in this analysis is that pupil/teacher ratios at the secondary level are consistently lower than those at the elementary level, regardless of how those ratios are analyzed. School districts in the Northeast tend to have lower ratios, while districts in the West higher ones. On the other hand, there is a less obvious relationship between the pupil/teacher ratio and the type of community. Although rural districts tend to have the lowest pupil/teacher ratios, and suburbs seem to have lower ratios than cities, the differences across medium, large and very large cities or suburbs are not as pronounced. As district size increases, so does the pupil teacher ratio.

Relationships between income levels or minority enrollments and the pupil/teacher ratio are not obvious, with districts at the lowest and highest extremes of these measures appearing to have the lowest pupil/teacher ratios. Not surprisingly, as expenditures per pupil increase, the pupil/teacher ratio declines, although as the percent of total expenditures devoted to instruction changes, the impact on the pupil/teacher ratio is not as significant.

The next section of this paper considers the interrelationships among these variables and attempts to estimate what impact each has on the overall pupil/teacher ratio. However, before the results of that analysis are described, the next two parts of this section describe how other teacher characteristics and teacher salaries vary across the categories described above.

DISTRICT LEVEL VARIATION IN TEACHER CHARACTERISTICS

The SASS Teacher Demand and Shortage Questionnaire asked each district level respondent to indicate the number of teachers that have and do not have standard state certification in their fields of assignment. It also asked for the ethnic breakdown of the teaching staff. It is therefore possible to see if the proportion of teachers without certification and the percentage of minority teachers vary by certain district characteristics.

Across the 4,370 districts in our sample, an average of 3.2 percent of each district's teachers did not have standard state certification. This ranged from a low of zero to a high of 100 percent of a district's teaching staff. This figure is somewhat misleading because 2,986 or 68.3 percent of the districts did not have any non-certificated teachers on their staff in 1987-88. This implies that those districts that did rely on non-certificated teachers had a higher proportion of such teachers than it appears here.

Similarly, 1,488 or 34 percent of the districts did not have any minority teachers on their staff. Across the entire sample, there were an average of 8.0 percent minority teachers in each district, again ranging from a low of zero to a high of 100 percent. The balance of this section and the accompanying tables show how these two teacher measures vary with other district characteristics.

Table 16 shows how the percentage of non certificated teachers and minority teachers varies by the pupil/teacher ratio. For both indicators, higher class sizes appear to be correlated with higher percentages of non-certificated and minority teachers. This pattern is not very strong, and the limited meaningfulness of the findings is confirmed by the correlation of the pupil/teacher ratio with the percent of non-certificated teachers of 0.05, and with the percent of minority teachers of 0.11.

Table 17 shows that as district size increases, there is a tendency to have more non-certificated teachers and a higher percentage of minority teachers. The correlation coefficients between district size (enrollment) and these two variables are 0.05 and 0.17 for non-certificated and minority teachers respectively.

Table 18 shows that the highest percentages of both non-certificated teachers and minority teachers are in the West and South. Districts in both regions have an average of over 4 percent of their teaching staff without certification. In the South, an average of 18 percent of a district's teachers are minorities, proportion of the teachers is nearly 18 percent, while in the west that figure exceeds 9 percent. The figures for both the Northeast and North Central regions are considerably lower.

Although the correlation between these two teacher variables and the proportion of students qualifying for free or reduced price lunches is low, the data displayed in Table 19 shows that as the percent of students who qualify for lunch programs increases, the percentage of minority teachers increases as well. A stronger relationship between minority enrollment and minority teachers is displayed in Table 20. In that table, it is clear that as the minority enrollment increases, so does the percentage of teachers who are also ethnic minorities. The correlation between the percent of minority pupils and percent of minority teachers is 0.69, which confirms the strong relationship. As with the data on percent of students qualifying for free or reduced price lunches, there is little relationship between that variable and the proportion of non-certificated teachers.

No relationship between expenditures and the two teacher character variables was found. Table 21 shows a slight tendency for low spending districts to have a higher percentage of both non-certificated teachers and minority teachers, but again, an analysis of the correlation coefficients shows they are not statistically different from zero, implying a weak relationship at best.

In summary, it seems there is very little relationship between the district characteristics considered in this document and the tendency of school districts to hire either non-certificated teachers or minority teachers. Large districts, and districts with high minority enrollments tend to have higher percentages of minority teaches than other districts, but beyond this, few patterns emerge from these data. The next part of this section looks at how each of these district characteristics are related to teacher salaries and school district salary schedules.

VARIATION IN TEACHER SALARIES AND SALARY SCHEDULES AT THE DISTRICT LEVEL

General Findings

Teacher salaries are the largest single component of school district budgets. Therefore it is important to analyze variations in average teacher salary and variations in the components of teacher salary schedules to fully understand how educational resources are allocated at the district level. The SASS Teacher Demand and Shortage Questionnaire asked respondents to indicate what their district's average teacher salary was, as well as to provide information on their district's salary schedule at three points -- bachelor's degree with no previous teaching experience, master's degree (or its equivalent in credits beyond the bachelor's degree) with no previous teaching experience and master's degree with 20 years of teaching experience.

One pattern that emerges from the data in the tables that follow, is the relationship between average teacher salary and the three salary schedule data points. Table 22 displays the correlation matrix for these four salary variables. The strength of the correlation among the salary variables is clear from this table, and explains why the patterns that emerge below are consistent across all four salary variables considered in the analysis.

Table 23 shows how teacher salaries vary with the pupil/teacher ratio. No clear pattern emerges from this analysis. The correlations of the salary variables with the pupil/teacher ratio are all very low and negative. However, in no case does the absolute value of any of the correlation coefficients exceed 0.078 (all significant at the 0.01 level), indicating that the relationship between class size and teacher salary is essentially random.

The only surprising finding is the very low salaries for those districts with the lowest pupil/teacher ratios. One might expect high salaries in those districts given the correlation between low pupil/teacher ratio and high per pupil expenditures. This is probably because districts with the lowest pupil/teacher ratios are small rural districts that, facing a limited market for teachers, hire young inexperienced individuals, or facing very low student enrollments are unable to offer high salaries to maintain an adequate sized teaching staff.

There is a slightly positive correlation between school district size and the salary figures. Table 24 shows that the average teacher salary tends to increase as district size increases, although the pattern is most significant for districts with less than 5,000 students. Beyond that point, the difference in average teacher salary across size categories is just over $500. Interestingly, while similar patterns emerge from the salary schedule data, with average salary at each increment increasing with district size, the range from the low to high by size category increases with education and experience. For teachers with a BA and no experience in the largest districts, the average salary of $19,156 is 17.15 percent higher than the same salary figure for the smallest districts, whereas for teachers with a MA and 20 years experience the highest figure (in the second largest district size category) of $32,233 is 25.50 percent higher than the figure for the smallest districts.

The impact of the limited differences in the larger districts is clear when the correlation coefficients are analyzed. The correlation between enrollment and the salary for teachers with a BA and no experience is only 0.14, while for the other two salary schedule variables and average salary, the correlation coefficient is between 0.11 and 0.12, hardly a substantial relationship.

There are significant geographic differences in teacher salaries. Salaries and their related schedules are higher in the Northeast and West than in the North Central and South regions of the country. This is shown in Table 25 which indicates that teacher salaries are highest in the Northeast averaging over $28,000, and lowest in the South with an average of $22,338. Since the SASS did not ask for information on the average experience and educational attainment of the teachers in each district, it is impossible to determine exactly how much of this difference is the result of higher teacher salary schedules in the Northeast and West, and how much results from greater teacher education and experience in those parts of the country. Since the average salary schedule amount for both the BA and the MA with no experience is higher in the West than in the Northeast, but lower at the MA plus 20 level, it seems likely that teacher experience and education play a major role in the differences in average salary which is higher in the Northeast.

Table 26 shows how average salary varies with the proportion of students who qualify for free or reduced price lunches. For all four salary variables, there is a pattern of declining salary as the percent of low income students increases. However, this pattern seems more pronounced for average salaries than for the salary schedule data, indicating that more experienced teachers may be employed in districts with relatively lower numbers of children who qualify for free and reduced price lunches. No clear pattern emerges from a similar comparison of salaries minority enrollments as shown in Table 27. On the other hand, there is a very clear relationship between per pupil expenditures and average teacher salaries. Table 28 shows this pattern very clearly. As expenditures per pupil increase, so does the average salary.

Determinants of Average Teacher Salary at the District Level

To determine what impact various district characteristics have on teacher salaries four multiple regression equations were estimated. The dependent variables used in the four equations were average teacher salary (SALAVG), Average salary with a BA and no experience (SALBA0), average salary with a MA and no experience (SALMA0), and average salary with a MA and 20 years teaching experience (SALMA20). The independent variables were same as those used in Table 15, except the average salary variable was replaced with two teacher/pupil ratios, one for the K-6 ratio and one for the 7-12 ratios. Regressions were also run using only the K-12 teacher pupil ratio, but a better fit was obtained using the two separate variables for the teacher/pupil ratio. The results of these four equations are displayed in Table 29.

One thing that stands out from Table 29 is the strength of all of the variables in explaining variations in average teacher salaries. As anticipated, the teacher/pupil ratio variables have a negative sign indicating that as the teacher/pupil ratio increases (class sizes decrease), teacher salaries go down. The coefficient of -51387 for TPLK6 implies that if the teacher/pupil ratio were to increase by 0.01 from say 0.05 to 0.06 (which corresponds to a decrease in the pupil/teacher ratio of 3.33 students from 20 to 16.67), average teacher salary would be expected to decrease by approximately $514. The smaller coefficient on TPL712 in Table 29 indicates that secondary grade teacher salaries are not as susceptible to tradeoffs between class size and teacher salary as are elementary salaries.

Columns 2,3 and 4 of Table 29 show that changes in class size have a greater impact on higher salaries than lower ones. The absolute value of the coefficient increases with increments in education and experience. This finding is not as surprising as it first appears since typical school district salary schedules have ratio of approximately two to one from the lowest to the highest salary. Since the relationships among salaries within a given schedule tend to remain relatively constant, the coefficient on the master's degree plus 20 years experience variable, would logically be higher than the coefficient for a bachelor's degree and no experience. Moreover, as expected since individuals with master's degrees earn more than individuals without them, the coefficient for master's degrees with no experience is higher than the coefficient for the bachelor's degree with no experience.

Table 29 points out another interesting relationship in school district resource allocation decisions. As per pupil expenditures increase, so too do average teacher salaries. The value of the coefficient for SALAVG of 1.606 implies that an additional expenditure of one dollar per pupil will lead to an increase in average teacher salaries of $1.60. While this might seem problematic at first, remember that the average pupil/teacher ratio in the sample is 16.47, indicating that if expenditures per pupil increase by one dollar, a total of $16.47 in funds are available for expenditure in each classroom. If only $1.60 is used to pay teachers more, where does the balance of those funds go? As shown above, a large portion (40% of $16.47) goes to reduced class sizes, but as the equations reported Table 27 indicate, even this class size reduction only accounts for $6.59 of the remaining $14.87, suggesting that $8.23 goes for other non-teaching expenditures.

The coefficients for PPEXP for the salary schedule variables follow the same pattern observed for teacher/pupil ratios, carrying higher values as teacher education and experience increase. This implies that larger shares of additional dollars go to the more experienced and better educated teachers on a district's teaching staff.

The impact of enrollment on teacher salaries is stronger than it appears in Table 21. Although only the coefficients for teaches with no experience are statistically significant, those coefficients imply that larger districts offer beginning teachers substantially higher salaries. The coefficient of 0 0048 for SALBA0 indicates that at the mean, increases in student enrollment are associated with an increase in the salary schedule for beginning teachers with a BA of $84.49 per student. This number seems quite high, an no doubt tapers off as enrollments increase as implied in Table 21.

Interestingly, the percentage of pupils qualifying for free and reduced price lunches has a negative impact on teacher salaries. The reasons for this are not clear, and probably require more analysis of the distribution of those pupils across school districts. One possible theory is that this index, which serves as a reasonable proxy for income level is higher in low income areas. The labor market in those areas may not be as competitive in terms of salary as other markets, thus have a negative impact on the level of teacher salary schedules, and similarly on the average teacher salary in the district. It is also possible that many of the rural districts in the sample have high percentages of children who qualify for free and reduced price lunches, and, as shown above, rural districts have lower average salaries.

Related to this is the finding that the percentage of minority students has a positive impact on salary schedules for teaches at the BA and MA level with no experience. High minority enrollments are most often found in urban areas where the cost of living is generally higher. Consequently, these districts have to offer higher wages for teachers to compete in the local labor market.

District location has a tremendous impact on average teacher salary and on teacher salary schedules. The coefficients were all relatively large, and with the exception of Indian reservations and one military base salary figure, were all significant ant the 0.01 level. The coefficients in Table 28 indicate that teachers in all size cities and suburbs are paid more than their rural counterparts. Moreover, teachers in the suburbs of very large cities appear to have the highest average salaries, followed by teachers in the suburbs of large cities. Interestingly, teachers in suburbs of medium size cities do not fare as well, having the second smallest advantage over their rural counterparts. Only teachers in small cities less of a salary advantage. Teachers in very large cities do not enjoy as large a salary advantage over rural teachers as do colleagues in medium and large cities. However, the salary schedule regressions indicate that at a given level on the salary schedule, salaries in the very large districts are higher than all but the very large suburban district salaries compared to rural districts. This implies that the teachers in very large cities most likely have less experience and/or lower educational attainment. Since these very large districts also have the highest minority enrollments, this seems to confirm the findings based on district minority enrollments reported above.

In summary, it appears that there are a number of district characteristics that affect teacher salaries. District location has a major impact on salary levels, although there is some evidence that more experienced teachers favor suburban districts to large and very large city districts. As expenditures increase, so too do teacher salaries. Moreover, districts with lower class sizes tend to pay their teachers less, implying a direct trade-off between class size and salary.

THE DETERMINANTS OF SPENDING ON TEACHER RESOURCES

The discussion above provides a description of how a variety of factors impact school district spending decisions on teacher salaries and class size. The question that remains to be answered is: How do school districts spend an additional dollar of revenue,

and what portion of that dollar will be spent on teacher resources? Moreover, once that portion is determined, how are those resources divided between higher teacher salaries and smaller class sizes?

When a district receives additional funds, it can elect to use those funds in one of three ways. The money can be used to increase teacher salaries, to reduce class sizes, or it can be used for other district expenditures. Tables 12 and 13 show that class size tends to decrease as expenditures increase, and Table 28 shows a pattern of teacher salaries increasing with expenditures per pupil. Of interest here is what portion of each new dollar is used for teacher resources, and of that portion, how much is devoted to smaller classes and how much to higher salaries. The elasticity of each of these (class size and salary) with respect to expenditures can be estimated from a log-log regression of each on per pupil expenditures. The resulting coefficient represents the respective elasticity. Summing the two coefficients yields an estimate of the total elasticity of spending on teachers with respect to per pupil expenditures. Assuming the elasticity is less than one, it can be assumed that the remaining portion of each additional dollar is allocated to other district functions.

Barro (1992) reports at the state level, a total elasticity of 0.82 for per pupil expenditures,. This is composed of 0.62 for class size and 0.20 for average teacher salary. This implies that if a school district receives an additional dollar of revenue, 82 cents will go towards expenditures for teachers, with 62 cents devoted to smaller class size and 20 cents for higher teacher salaries. Barro's data are based on deflated expenditures as described above, and deflated average teacher salary data using an index established at the state level by Nelson (1991).

Barro's state level analysis was replicated at the district level using the SASS/Census data set. Expenditure data were deflated using Barro's index as described above, and teacher salary data deflated by the index proposed by Nelson (1991) and used by Barro (1992) in his analysis.[6] As shown in Table 30, the results were considerably different than Barro's findings. The coefficient for per pupil expenditures with respect to the teacher pupil ratio was 0.40. A standard error of 0.01 was reported, with an adjusted R^2 of 0.28. The coefficient was significant at the 0.0001 level. Similarly, the coefficient for per pupil expenditures with respect to average salary was 0.09, with a standard error of 0.01 an R^2 of 0.026 and significant at the 0.0001 level.

The findings reported in Table 30 imply a substantially lower elasticity than reported by Barro. The table indicates that an additional dollar of revenue would lead to increased spending of only 49 cents for teachers, 40 cents to reduce class size and 9 cents to increase teacher salaries. Because of these differences a number of diagnostic checks were made. In particular, the regression equations were estimated using state sub samples for those states with the largest number of districts included in the sample. The results of these regressions were mixed, with the elasticities for each component varying widely, and thus of little help in determining the accuracy of our findings.

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[6]Two log-log equations were estimated. The first regressed the log of the teacher pupil ratio on the log of deflated per pupil expenditures and the second regressed the log of deflated average teacher salary. For the first equation, the dependent variable was the ratio of teachers to pupils, which is opposite of the ratio reported in the descriptive section above. The use of a teacher pupil ratio has no impact on the findings, but makes analysis more straightforward.

Although other diagnostic exercises were not possible, we believe the district level findings displayed in Table 30 are accurate, and that the difference between these results and Barro's has to do with the unit of analysis. Barro relied on aggregate data from the 50 states plus the District of Columbia whereas the data reported here were collected from a nationally representative sample of over 4,000 school districts. It seems plausible that use of state averages masks much of the variation found in school district resource allocation decisions, leading to our disparate results. If these estimates can be confirmed with data from the 1990-91 SASS, this finding has important implications for the development of Federal school finance policy which has traditionally used state aggregates as the unit of analysis in the allocation of funds. Policymakers may want to look at the alternative of using district level data for future school finance programs.

A related, and perhaps more important question to ask is if only 49 cents of each additional dollar is used for teacher resources to reduce class size and increase salaries, how are the remaining 51 cents spent? Although data from SASS do not permit detailed analysis of this issue at the district level, some possibilities include increased expenditures for employee benefits, more expensive instructional materials, increased use of personnel for purposes not directly associated with classroom instruction such as counselors, psychologists, etc., and increased numbers of administrators. We hope that future research at the state level will help clarify where some of these additional resources are going.

The elasticities reported above indicate that more resources are devoted to lowering class size than to increasing teacher salaries when new funds are made available. The next section takes a closer look at how different school district characteristics impact class size through the teacher/pupil ratio.

CONCLUSIONS

This paper provides a great deal of new information about how school districts allocate educational resources, particularly teaching resources. What is most notable about the findings presented in this paper is that in a number of instances, they differ from trends identified by others in analyses of state level expenditure data. This is particularly noticeable in the estimation of elasticities of per pupil expenditures with respect to class size and teacher salary. This study found a total elasticity of 0.49 compared to Barro's estimate of 0.82 when state level data are used.

While this dramatic difference is difficult to explain, and may call some of the findings into question, it does demonstrate the importance of looking at educational resource allocation decisions at the smallest unit possible. Fortunately, it will be possible to re-estimate these elasticities in the near future using data from the 1990-91 SASS and the 1990-91 Census data collection on school district finances. Both data sets should be available for distribution early this year (1993), making it possible to check on the validity of the findings reported here.

In the meantime, the discrepancies between district level and state level analysis should give federal policymakers a reason to pause as they consider how future educational assistance payments should be distributed. The findings presented here imply that there are substantial intra-state variations in school district expenditure patterns, both in terms of total expenditures and in the way those funds are used. Much of that may be masked by state level aggregations. This would indicate that Federal policymakers may want to make district expenditures and other district level measures the focus of fund distributions in the future.

For example, programs designed to provide assistance to low spending districts that distribute funds to states for redistribution to districts might unnecessarily reward high spending districts in otherwise low spending states, and ignore low spending districts in generally high spending states. Directing Federal aid to the district level could alleviate some of these problems.

Perhaps a more important question posed by this study's findings is, where do the rest of the dollars go? If, as indicated above, we can only account for 49 cents of each additional dollar being devoted to teacher resources, how is the other 51 cents being used, and are those funds being used in ways that improve student outcomes? Unfortunately, the SASS data do not allow us to answer these questions. However, work going on concurrent to this at the Finance Center of CPRE is attempting to seek answers to these complex questions using detailed state data bases from Florida and California.

Table 1

Summary Statistics for Total Per-Pupil Expenditures for Current Operations, Per Pupil Expenditures for Instruction and the Percent of Total Expenditures Devoted to Instruction: 1986-87

Statistic	Per Pupil Expenditures for Current Operations PPEXP ($)	Per Pupil Expenditures for Instruction PPEXI ($)	Instruction as a Percent of Total PPEXIP (%)
Mean	3,659	2,137	59.16
Standard Deviation	1,912	961	6.28
Maximum	57,170	19,677	95.70
Minimum	861	520	18.12
Range	56,309	19,157	77.58
Median	2,795	1,933	58.97
Inter-quartile range	1,232	734	7.26
Range (99-1)	7,921	4,453	31.72
Range (95-5)	3,855	2,188	21.41
Range (90-10)	2,787	1,595	15.06
Coefficient of Variation	0.524	0.450	0.106

Table 2

Summary Statistics for Total Per-Pupil Expenditures for Current Operations, Per Pupil Expenditures for Instruction and the Percent of Total Expenditures Devoted to Instruction, Adjusted for Interstate Cost of Education Differences: 1986-87

Statistic	Adjusted Per Pupil Expenditures for Current Operations PPEXP ($)	Adjusted Per Pupil Expenditures for Instruction PPEXI ($)	Instruction as a Percent of Total Adjusted Expenditures PPEXIP (%)
Mean	3,698	2,164	59.16
Standard Deviation	1,759	825	6.28
Maximum	68,880	16,963	95.70
Minimum	742	452	18.12
Range	68,137	16,511	77.58
Median	3,407	2,007	58.97
Inter-quartile range	1,152	682	7.26
Range (99-1)	6,742	3,630	31.72
Range (95-5)	3,329	1,884	21.41
Range (90-10)	2,351	1,370	15.06
Coefficient of Variation	0.476	0.381	0.106

Table 3
Variation in Per Pupil Expenditures by Region and Community Type

Category	Actual		Deflated		Percent of Expenditures for Instruction (%)
	Total Expenditures Per Pupil ($)	Expenditures Per Pupil for Instruction ($)	Total Expenditures Per Pupil ($)	Expenditures Per Pupil for Instruction ($)	
Geographic Region					
Northeast	4,601	2,763	4,292	2,563	59.67
North Central	3,541	2,017	3,708	2,109	57.60
South	2,917	1,778	3,223	1,965	61.48
West	4,024	2,278	3,795	2,156	57.86
Community Type					
Rural/Farming	3,552	2,044	3,705	2,135	58.70
Small City	3,486	2,085	3,509	2,105	60.14
Medium City	3,804	2,243	3,682	2,181	59.40
Medium Suburb	3,641	2,161	3,567	2,122	59.63
Large City	3,865	2,241	3,739	2,175	58.18
Large City Suburb	4,040	2,380	3,935	2,316	59.15
Very Large City	3,944	2,287	3,786	2,193	58.21
Very Large City Suburb	4,698	2,700	4,419	2,541	57.60
Military Base	3,596	2,125	3,632	2,146	59.72
Indian Reservation	6,483	3,277	6,530	3,295	52.98

Table 4

Summary Statistics for Pupil Teacher Ratio: 1987-88

Statistic	Pupil Teacher Ratio Grades K-12 PTLK12	Pupil Teacher Ratio Grades K-6 PTLK6	Pupil Teacher Ratio Grades 7-12 PTL712
Mean	16.59	18.54	15.47
Standard Deviation	3.92	7.92	6.23
Maximum	40.50	40.50	40.50
Minimum	2.00	2.00	2.00
Range	38.50	38.50	38.50
Median	16.40	17.85	14.97
Inter-quartile range	4.66	5.18	5.68
Range (99-1)	19.50	21.98	24.76
Range (95-5)	13.00	14.50	15.69
Range (90-10)	9.49	11.03	11.51
Coefficient of Variation	0.236	0.367	0.398
Number of Observations	4,370	4,225	4,257

Table 5
Distribution of Pupil Teacher Ratio by District

Pupil Teacher Ratio	Grades K-12		Grades K-6		Grades 7-12	
	Number of Districts	Percent of Districts (%)	Number of Districts	Percent of Districts (%)	Number of Districts	Percent of Districts (%)
Less than 10	171	3.91	90	2.13	452	10.62
10.00 to 12.99	548	12.54	317	7.50	910	21.38
13.00 to 15.99	1,280	29.29	822	19.46	1174	27.58
16.00 to 18.99	1,369	31.33	1358	32.14	929	21.82
19.00 to 21.99	612	14.00	866	20.50	432	10.15
22.00 to 24.99	255	5.84	432	10.22	199	4.67
25 or more	135	3.09	340	8.05	161	3.78
Total	4370	100.00	4225	100.00	4257	100.00

Table 6
Distribution of Pupils by Pupil Teacher Ratio

Pupil Teacher Ratio	Grades K-12		Grades K-6		Grades 7-12	
	Number of Pupils	Percent of Pupils (%)	Number of Pupils	Percent of Pupils (%)	Number of Pupils	Percent of Pupils (%)
Less than 10	96795	0.38	44317	0.32	280516	2.47
10.00 to 12.99	973078	3.85	362821	2.61	1149004	10.11
13.00 to 15.99	4665675	18.46	1785837	12.84	2771007	24.39
16.00 to 18.99	10369891	41.04	4556375	32.77	3776958	33.25
19.00 to 21.99	5250810	20.78	3431438	24.68	1807003	15.91
22.00 to 24.99	2717964	10.76	1741532	12.52	982730	8.65
25 or more	1194602	4.73	1982584	14.26	592613	5.22
Total	25268815	1.00	13904904	1.00	11359831	1.00

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Table 7
Average Pupil Teacher Ratio by District Size

District Enrollment	Grades K-12		Grades K-6		Grades 7-12	
	Number of Districts	Mean Pupil Teacher Ratio	Number of Districts	Mean Pupil Teacher Ratio	Number of Districts	Mean Pupil Teacher Ratio
1- 499	613	11.53	601	13.51	550	9.03
500- 999	518	14.45	472	16.50	506	11.56
1,000- 2,499	1129	16.02	1092	17.52	1116	14.30
2,500- 4,999	964	16.64	940	17.72	950	15.33
5,000- 9,999	615	17.28	601	18.35	607	15.95
10,000- 24,999	389	18.38	377	19.42	386	17.06
25,000- 49,999	84	18.42	84	19.46	84	17.18
50,000 or more	58	18.69	58	19.30	58	17.75

Table 8
Average Pupil Teacher Ratio by Geographic Region

	Pupil Teacher Ratio		
Region	K-12	K- 6	7-12
Northeast	13.84	15.54	12.16
North Central	15.26	17.06	13.39
South	16.18	17.34	14.13
West	17.22	18.47	14.97

Table 9
Pupil Teacher Ratio by Community Type

Community Type	Grades K-12			Grades K-6			Grades 7-12		
	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio
Rural	1921	43.96	14.68	1892	44.78	16.50	1863	43.76	12.32
Small City	1292	29.57	16.00	1244	29.44	17.30	1267	29.76	14.60
Medium City	283	6.48	17.06	267	6.32	18.28	277	6.51	15.65
Medium Suburb	207	4.74	16.39	202	4.78	17.73	204	4.79	15.06
Large City	112	2.56	17.48	106	2.51	18.32	111	2.61	16.18
Large Suburb	266	6.09	16.37	255	6.04	17.76	262	6.15	14.93
Very Large City	53	1.21	17.27	48	1.14	18.52	50	1.17	16.45
Very Large Suburb	198	4.53	15.75	173	4.09	16.95	187	4.39	14.01
Military Base	20	0.46	17.04	20	0.47	19.46	19	0.45	14.04
Indian Reservation	18	0.41	10.81	18	0.43	13.23	17	0.40	8.36
Total	4370	100.00		4225	100.00		4257	100.00	

Table 10
Pupil Teacher Ratio By Percentage of Pupils Qualifying for Free or Reduced Price Lunch

Percent of Pupils Qualifying for Free or Reduced Price Lunch	Grades K-12			Grades K-6			Grades 7-12		
	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio
less than 5	434	9.93	14.35	387	9.16	15.53	407	9.56	12.64
5 to 9.99	407	9.31	15.67	379	8.97	17.51	400	9.40	14.10
10 to 14.99	454	10.39	16.00	429	10.15	17.76	445	10.45	14.22
15 to 19.99	482	11.03	15.80	464	10.98	17.45	473	11.11	13.95
20 to 24.99	481	11.01	15.95	473	11.20	17.57	474	11.13	14.10
25 to 29.99	505	11.56	15.67	500	11.83	17.18	490	11.51	13.87
30 to 34.99	342	7.83	15.08	340	8.05	16.72	334	7.85	13.25
35 to 39.99	299	6.84	15.53	296	7.01	17.06	295	6.93	13.72
40 to 44.99	221	5.06	15.50	219	5.18	17.06	217	5.10	13.93
45 to 49.99	171	3.91	16.08	169	4.00	17.15	168	3.95	14.75
50 or more	574	13.14	15.27	569	13.47	16.61	554	13.01	12.29
Total	4370	100.00		4225	100.00		4257	100.00	

Table 11
Pupil Teacher Ratio by Percentage Minority Enrollment in District

Percent Minority Enrollment	Grades K-12			Grades K-6			Grades 7-12		
	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio
less than 5	2499	57.19	15.13	2430	57.51	16.92	2424	56.94	13.18
5 to 9.99	497	11.37	16.61	471	11.15	18.08	486	11.42	14.75
10 to 19.99	454	10.39	15.92	431	10.20	16.92	442	10.38	14.53
20 to 29.99	267	6.11	16.23	254	6.01	17.12	262	6.15	15.22
30 to 39.99	170	3.89	16.53	166	3.93	17.45	169	3.97	15.38
40 to 49.99	109	2.49	16.61	108	2.56	17.76	108	2.54	10.18
50 to 59.99	124	2.84	16.08	123	2.91	17.61	122	2.87	14.06
60 to 69.99	66	1.51	16.78	65	1.54	17.04	66	1.55	15.97
70 or more	184	4.21	13.83	177	4.19	15.24	178	4.18	12.18
Total	4370	100.00		4225	100.00		4257	100.00	

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Table 12
Pupil Teacher Ratio by Total District Expenditures Per Pupil

Expenditures Per Pupil	Grades K-12			Grades K-6			Grades 7-12		
	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio
less than 1,500	29	0.67	16.28	29	0.86	17.51	28	0.66	12.96
1,500 to 1,999	104	2.40	19.00	101	3.00	19.17	100	2.37	18.27
2,000 to 2,499	469	10.82	17.85	467	13.88	18.84	463	10.96	16.34
2,500 to 2,999	925	21.34	17.05	92	2.73	18.24	903	21.38	15.57
3,000 to 3,499	1041	24.01	16.69	1028	30.56	18.21	1017	24.08	14.78
3,500 to 3,999	656	15.13	15.50	635	18.88	17.38	645	15.27	13.48
4,000 to 4,499	368	8.49	14.86	349	10.37	16.57	355	8.40	12.89
4,500 to 4,999	251	5.79	13.44	233	6.93	15.25	244	5.78	9.71
5,000 to 5,499	163	3.76	12.78	145	4.31	14.64	158	3.74	10.93
5,500 to 5,999	115	2.65	12.53	105	3.12	14.23	110	2.60	10.52
Over 6,000	214	4.94	10.33	180	5.35	11.17	201	4.76	9.12
Total	4335	100.00		3364	100.00		4224	100.00	

Table 13
Pupil Teacher Ratio by Expenditures Per Pupil for Instruction

Expenditures Per Pupil for Instruction	Grades K-12			Grades K-6			Grades 7-12		
	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio
less than 1,500	647	14.93	18.06	641	15.31	18.90	637	15.08	16.63
1,500 to 1,999	1771	40.85	16.85	1745	41.69	18.24	1728	40.91	15.13
2,000 to 2,499	1002	23.11	15.55	964	23.03	17.33	981	23.22	13.46
2,500 to 2,999	479	11.05	13.88	441	10.54	15.64	464	10.98	12.15
3,000 to 3,499	224	5.17	12.12	210	5.02	14.21	215	5.09	8.46
3,500 to 3,999	89	2.05	11.97	76	1.82	13.43	88	2.08	10.22
4,000 to 4,499	35	0.81	11.50	31	0.74	13.14	29	0.69	9.97
4,500 to 4,999	23	0.53	9.46	20	0.48	10.56	23	0.54	8.49
5,000 to 5,499	18	0.42	11.89	17	0.41	13.21	17	0.40	10.47
5,500 to 5,999	11	0.25	7.59	9	0.22	8.09	10	0.24	6.18
Over 6,000	36	0.83	8.27	32	0.76	7.95	32	0.76	8.51
Total	4335	100.00		4186	100.00		4224	100.00	

Table 14
Pupil Teacher Ratio by Percentage of Total Expenditures Devoted to Instruction

Percent of Total Expenditures Devoted to Instruction	Grades K-12			Grades K-6			Grades 7-12		
	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio	Number of Districts	Percent of Districts (%)	Average Pupil Teacher Ratio
Less than 50	268	6.18%	14.39	242	5.77%	16.17	258	6.11%	12.34
50 to 54.99	724	16.71%	15.60	697	16.62%	16.97	707	16.74%	14.00
55 to 59.99	1531	35.33%	15.72	1477	35.21%	17.35	1499	35.50%	13.95
60 to 64.99	1160	26.77%	15.68	1134	27.03%	17.26	1130	26.76%	13.84
65 to 69.99	406	9.37%	15.64	401	9.56%	17.17	394	9.33%	13.65
70 to 74.99	189	4.36%	14.85	188	4.48%	17.05	183	4.33%	11.09
75 to 79.99	52	1.20%	13.75	52	1.24%	14.56	48	1.14%	12.21
More than 80	4	0.09%	15.45	4	0.10%	17.89	4	0.09%	11.12
Total	4334	1		4195	1		4223	1	

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Table 15
Determinants of Teacher/Pupil Ratios:

Independent Variable	Dependent Variable Teacher Pupil Ratio		
	Grades K-12 TPLK12	Grades K-6 TPLK6	Grades 7-12 TPL7-12
Intercept	0.06987*	0.061*	0.0831*
	(0.00140)	(0.002)	(0.0054)
Per Pupil Expenditures (PPEXP)	0.0000033*	0.0000028*	0.00000093*
	(0.00000009)	(0.0000001)	(0.00000066)
Enrollment (LEAENR1)	-0.000000064*	-0.000000043*	-0.000000095
	(0.00000001)	(0.000000020)	(0.000000060)
% Free/Reduced Lunch (POVL)	-0.0000257**	-0.000009	0.0000779
	(0.0000120)	(0.000013)	(0.0000463)
% Minority Enrollment (MINPUPL)	-0.0000222	0.000004	-0.000072
	(0.0000132)	(0.000015)	(0.000051)
Average Salary (SALAVG)	-0.000000555*	-0.00000046*	-0.00000159*
	(0.000000050)	(0.00000006)	(0.00000023)
Small City (COMMUN2)	-0.0041*	-0.0015**	-0.0072*
	(0.0006)	(0.00067)	(0.0023)
Medium City (COMMUN3)	-0.0060*	-0.0033*	-0.0092**
	(0.0011)	(0.0012)	(0.0041)
Medium Suburb (COMMUN4)	-0.0048*	-0.0022	-0.0072
	(0.0012)	(0.0013)	(0.0046)
Large City (COMMUN5)	-0.0077*	-0.0045**	-0.0114
	(0.0016)	(0.0019)	(0.0063)
Large Suburb (COMMUN6)	-0.0041*	-0.0018	-0.0061
	(0.0011)	(0.0012)	(0.0043)
Very Large City (COMMUN7)	-0.0057**	-0.0038	-0.0076
	(0.0024)	(0.0028)	(0.0093)
Very Large Suburb (COMMUN8)	-0.0031**	-0.0009	-0.0032
	(0.0013)	(0.0015)	(0.0051)
Military Base (COMMUN9)	-0.0082**	-0.0074	-0.0066
	(0.0038)	(0.0041)	(0.0143)
Indian Reservation (COMMUN10)	0.0214*	0.0099**	0.0245
	(0.0041)	(0.0045)	(0.0160)
R-Square	0.296	0.189	0.060

Standard Errors are in parentheses
*Significant at the 0.01 level
**Significant at the 0.05 level

Table 16
Percentage of Non-Certificated Teachers and Percentage of Minority Teachers By Number of Teachers Per 1,000 Pupils

Pupil/Teacher Ratio	Number of Districts	Mean Percentage of Non-Certificated Teachers (%)	Mean Percentage of Minority Teachers (%)
33 or greater	5	0.00	1.01
25 to 32.99	132	4.87	9.84
20 to 24.99	574	4.43	9.51
16.67 to 19.99	1,314	3.38	10.24
14.28 to 16.66	1,179	2.77	7.84
12.5 to 14.27	599	2.98	5.33
11.11 to 12.49	283	2.35	4.68
10.0 to 11.10	112	1.62	3.45
less than 10	171	2.39	4.35

Table 17
Percentage of Non-Certificated Teachers and Percentage of Minority Teachers By District Size

District Enrollment	Mean Percentage of Non-Certificated Teachers (%)	Mean Percentage of Minority Teachers (%)
1- 499	2.24	3.70
500- 999	2.23	4.14
1,000- 2,499	2.53	6.19
2,500- 4,999	3.60	9.00
5,000- 9,999	3.86	10.64
10,000- 24,999	3.70	12.94
25,000- 49,999	9.26	20.76
50,000 or more	8.43	29.62

Table 18
Percentage of Non-Certificated Teachers and Percentage of Minority Teachers By Census Region

Census Region	Mean Percentage of Non-Certificated Teachers (%)	Mean Percentage of Minority Teachers (%)
Northeast	2.66	2.89
North Central	1.77	3.10
South	4.58	17.78
West	4.30	9.25

Table 19
Percentage of Non-Certificated Teachers and Percentage of Minority Teachers By Percent of Pupils Qualifying for Free or Reduced Price Lunches

Percent of Pupils Qualifying for Free or Reduced Price Lunches	Mean Percentage of Non-Certificated Teachers (%)	Mean Percentage of Minority Teachers (%)
less than 5	2.93	3.25
5 to 9.99	1.63	3.18
10 to 14.99	3.78	3.12
15 to 19.99	3.58	3.76
20 to 24.99	3.36	4.53
25 to 29.99	2.39	4.81
30 to 34.99	2.25	6.17
35 to 39.99	3.57	8.82
40 to 44.99	2.41	9.90
45 to 49.99	4.26	16.02
50 or more	4.60	25.96

Table 20
Percentage of Non-Certificated Teachers and Percentage of Minority Teachers By Percentage Minority Enrollment

Percentage Minority Enrollment (%)	Mean Percentage of Non-Certificated Teachers (%)	Mean Percentage of Minority Teachers (%)
less than 5	2.51	2.81
5 to 9.99	3.56	5.78
10 to 19.99	4.64	7.99
20 to 29.99	3.46	13.09
30 to 39.99	3.00	17.26
40 to 49.99	2.70	22.29
50 to 59.99	4.69	28.55
60 to 69.99	9.83	34.18
70 or more	4.47	37.68

Table 21
Percentage of Non-Certificated Teachers and Percentage of Minority Teachers By Expenditures Per Pupil

Expenditures Per Pupil ($)	Mean Percentage of Non-Certificated Teachers (%)	Mean Percentage of Minority Teachers (%)
less than 1,500	0.24	4.3
1,500 to 1,999	3.24	10.99
2,000 to 2,499	3.24	12.4
2,500 to 2,999	3.54	8.53
3,000 to 3,499	3.42	7.96
3,500 to 3,999	2.72	7.66
4,000 to 4,499	2.67	5.51
4,500 to 4,999	3.56	4.53
5,000 to 5,499	3.29	5.51
5,500 to 5,999	1.17	4.61
Over 6,000	2.28	7.87

Table 22
Correlation Coefficients For Teacher Salary Variables

Variable	Average	BA	MA	MA+20
Average	1.000			
BA	0.718	1.000		
MA	0.701	0.896	1.000	
MA + 20	0.799	0.716	0.709	1.000

Note: All Correlation Coefficients are Significant at the 0.01 level

Table 23
Average Salary and Mean of Salary Schedule Steps By Pupil/Teacher Ratio

Pupil/Teacher Ratio	Number of Districts	Annual Salary ($)			
		Average	BA	MA	MA+20
33 or greater	5	27,521	18,727	20,448	27,681
25 to 32.99	132	28,159	18,998	21,059	32,567
20 to 24.99	574	27,507	18,439	20,339	31,811
16.67 to 19.99	1,314	24,900	17,391	19,016	29,040
14.28 to 16.66	1,179	24,946	17,360	18,928	29,016
12.5 to 14.27	599	25,362	17,339	18,894	29,404
11.11 to 12.49	283	26,162	17,807	19,517	30,391
10.0 to 11.10	112	25,820	18,060	19,788	29,616
less than 10	171	23,726	17,281	18,857	27,808

Table 24
Average Salary and Mean of Salary Schedule Steps By District Size

District Size	Annual Salary ($)			
	Average	BA	MA	MA+20
1- 499	21,776	16,351	17,908	25,683
500- 999	23,803	16,837	18,286	27,757
1,000- 2,499	25,455	17,451	19,094	29,533
2,500- 4,999	26,684	17,973	19,659	30,855
5,000- 9,999	27,011	18,218	20,142	31,209
10,000- 24,999	27,497	18,616	20,283	31,913
25,000- 49,999	27,372	19,019	20,607	32,233
50,000 or more	27,552	19,156	20,634	31,975

Table 25
Average Salary and Mean of Salary Schedule Steps By Census Region

Teachers Per 1,000 Pupils	Annual Salary ($)			
	Average	BA	MA	MA+20
Northeast	28,382	18,333	19,907	32,853
North Central	25,291	17,007	18,694	29,321
South	22,338	17,078	18,440	26,256
West	27,620	18,785	20,943	31,878

Table 26
Average Salary and Mean of Salary Schedule Steps By Percentage of Pupils Qualifying for Free and Reduced Price Lunches

Percentage of Pupils Qualifying for Free and Reduced Price Lunches (%)	Annual Salary ($)			
	Average	BA	MA	MA+20
less than 5	29,929	19,040	20,963	34,333
5 to 9.99	28,378	18,343	20,159	32,762
10 to 14.99	26,443	17,681	19,320	30,851
15 to 19.99	25,822	17,607	19,241	29,951
20 to 24.99	25,058	17,310	18,929	29,243
25 to 29.99	24,521	17,173	18,923	28,444
30 to 34.99	23,584	16,898	18,472	27,557
35 to 39.99	24,006	17,212	18,731	28,084
40 to 44.99	23,550	17,127	18,633	27,543
45 to 49.99	23,416	17,216	18,698	27,355
50 or more	23,463	17,486	19,026	27,328

Table 27
Average Salary and Mean of Salary Schedule Steps By District Percentage of Minority Pupils

Percentage of Minority Pupils (%)	Annual Salary ($)			
	Average	BA	MA	MA+20
less than 5	24,732	17,070	18,658	28,861
5 to 9.99	27,675	18,383	20,194	31,700
10 to 19.99	27,478	18,567	20,325	31,595
20 to 29.99	25,985	18,258	19,946	30,405
30 to 39.99	25,404	17,937	19,647	29,343
40 to 49.99	24,132	17,486	18,990	28,083
50 to 59.99	24,257	17,988	19,626	28,649
60 to 69.99	23,484	17,641	19,230	27,486
70 or more	26,449	18,921	20,847	30,555

Table 28
Average Salary and Mean of Salary Schedule Steps By Expenditures Per Pupil

Expenditures Per Pupil ($)	Annual Salary ($)			
	Average	BA	MA	MA+20
less than 1,500	22,605	15,862	17,580	26,371
1,500 to 1,999	20,850	16,093	17,887	23,669
2,000 to 2,499	21,183	16,300	17,752	24,521
2,500 to 2,999	23,259	16,698	18,106	27,563
3,000 to 3,499	25,218	17,388	19,006	29,287
3,500 to 3,999	26,701	18,183	19,886	30,889
4,000 to 4,499	27,972	18,434	20,284	32,104
4,500 to 4,999	27,737	18,198	19,993	32,401
5,000 to 5,499	29,115	18,699	20,456	33,513
5,500 to 5,999	31,236	19,340	21,592	35,170
Over 6,000	32,607	20,671	23,116	37,734

Table 29
Determinants of Average Teacher Salary

Independent Variables	Dependent Variable			
		Salary Schedule Averages		
	Average Teacher Salary SALAVG	BA With No Experience SALBA0	MA With No Experience SALMA0	MA with 20 Years Experience SALMA20
Intercept	22166*	15937*	17557*	26454*
	(256)	(117)	(142)	(274)
K-6 Teacher Pupil Ratio (TPLK6)	-51387*	-20112*	-27050*	-65131*
	(3784)	(1719)	(2092)	(4039)
7-12 Teacher Pupil Ratio (TPL712)	-6063*	-2928*	-3699*	-7177*
	(1019)	(463)	(563)	(1088)
Per Pupil Expenditures (PPEXP)	1.606*	0.683*	0.806*	1.826*
	(0.045)	(0.020)	(0.025)	(0.048)
Enrollment (LEAENR1)	0.0056	0.0048*	0.0046**	0.0051
	(.0037)	(0.0017)	(0.0020)	(0.0039)
% Free/Reduced Lunch (POVL)	-35.297*	-7.343*	-10.397*	-40.470*
	(3.019)	(1.372)	(1.669)	(3.222)
% Minority Enrollment (MINPUPL)	0.3403	12.101*	14.478*	-1.493
	(3.39)	(1.540)	(1.874)	(3.618)
Small City (COMMUN2)	2148*	715*	864*	2230*
	(151)	(68)	(83)	(161)
Medium City (COMMUN3)	4400*	1418*	1482*	4487*
	(270)	(123)	(149)	(288)
Medium Suburb (COMMUN4)	3312*	936*	950*	3553*
	(303)	(138)	(168)	(324)
Large City (COMMUN5)	4437*	1430*	1435*	4867*
	(420)	(191)	(232)	(449)
Large Suburb (COMMUN6)	4934*	1440*	1160*	4725*
	(276)	(126)	(153)	(295)
Very Large City (COMMUN7)	4230*	1707*	1776*	5737*
	(647)	(294)	(357)	(690)

Continued on next page

Table 29 (continued)
Determinants of Average Teacher Salary

Independent Variables	Dependent Variable			
		Salary Schedule Averages		
	Average Teacher Salary SALAVG	BA With No Experience SALBA0	MA With No Experience SALMA0	MA with 20 Years Experience SALMA20
Very Large Suburb (COMMUN8)	6465* (340)	1842* (154)	2070* (188)	7254* (363)
Military Base (COMMUN9)	2906* (937)	776 (426)	1998* (518)	2660* (1000)
Indian Reservation (COMMUN10)	260 (1055)	298 (479)	632 (583)	1934 (1126)
R-Square	0.442	0.354	0.335	.462

Standard Errors are in parentheses
*Significant at the 0.01 level
**Significant at the 0.05 level

Table 30
Results of Log-Log Regressions to Estimate the Elasticities of Staffing Data with Respect to Per Pupil Expenditures
Independent Variable: Deflated Per-Pupil Expenditures

	Dependent Variable	
Statistic	Log of Teacher/Pupil Ratio (LTPL12)	Log of Average Salary (LAVGSAL)
Coefficient	0.40	0.09
Standard Error	0.01	0.01
Significance Level	0.0001	0.0001
Adjusted R-square	0.278	0.026

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